

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	III
EXECUTIVE SUMMARY	VI
Introduction.....	vi
Methodology.....	vi
Communication Issues.....	viii
Technology Summary.....	viii
Conclusion	xiv
CHAPTER I: INTRODUCTION	1
Scope of Work	1
Types of Radio Systems	1
Communications from Inside a Structure to the Outside or Vice Versa	3
Firefighter Radio Communications Problems	4
Organization for the Report	5
CHAPTER II: METHODOLOGY	6
Determination of Critical Areas of Interest	6
Literature Review	7
Fire Department Communication Issues Review	9
Knowledge Gaps Analysis.....	9
Recommendations.....	10
CHAPTER III: FIREFIGHTER COMMUNICATION ISSUES	11
Technical Issues	11
Human Factors.....	16
Applicable Standards and Regulations	18
Experiences From the Field	19
Communications Problems in Firefighter Fatalities	27
CHAPTER IV: STRUCTURE COMMUNICATIONS ISSUES	29
Communication Problems Inherent in Structures	29
Risk to Firefighters	35
Radio Spectrum Considerations.....	36
CHAPTER V: CURRENT TECHNOLOGY STATUS, KNOWLEDGE GAPS, AND RESEARCH NEEDS	43
Ultra Wideband.....	43
Mobile Area Networks.....	50
Channel Coding, Interleaving, and Encryption	57
Power Line Communications.....	59
RF Distribution in Buildings Using Heating and Ventilation Ducts	65
Alternative Frequency Bands.....	67
Electronic Status and Firefighter Location	71

Bi-directional Amplifiers	71
Smart Antennas	73
Spread Spectrum	75
Other Technologies	76
General Recommendations	77
Summary of Recommendations	79
APPENDIX A: PRIORITIZED PROJECT ISSUES	82
APPENDIX B: FIRE DEPARTMENT COMMUNICATIONS – EXPERIENCES FROM THE FIELD.....	86
Austin, TX	87
Bellingham, WA	88
Boston, MA.....	89
Boulder, CO Rural Fire Department.....	90
Brighton, CO.....	91
Charlotte, NC	91
Chicago, IL	92
Clark County, NV	93
Dallas, TX.....	94
Detroit, MI	95
Everett, WA	95
Fairfax County, VA	96
Gettysburg, OH.....	97
Los Angeles, CA.....	98
Milwaukee, WI	99
Phoenix, AZ	99
Pittsburgh, PA.....	100
Portland, OR	101
San Antonio, TX	102
San Diego, CA	103
San Francisco, CA	103
Schaumburg, IL	104
Springfield, NJ	105
Wichita, KS.....	106
GLOSSARY OF TERMS AND ABBREVIATIONS	107
Terms.....	107
Abbreviations and Acronyms	108
MASTER REFERENCE LIST.....	111
BIBLIOGRAPHIC REFERENCES BY SUBJECT AREA	140